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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

ROAD RIGHT-OF-WAY HANDBOOK

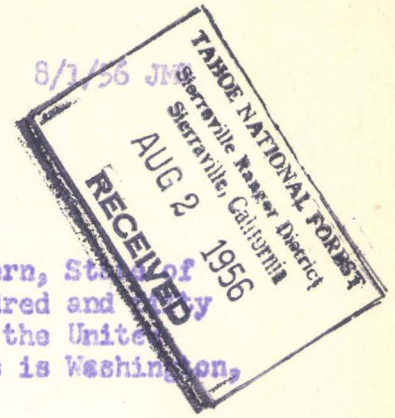


1941

CALIFORNIA REGION
S. B. SHOW, Regional Forester

Insert - Right of Way Handbook

DEED OF FURTHER ASSURANCE



THIS INDENTURE, MADE and executed at Kernville, County of Kern, State of California, this _____ day of July, one thousand nine hundred and _____ six, by and between J. Carl Howe - single man, grantor, and the United States of America and its assigns, whose post office address is Washington, D. C., grantee.

Whereas the said grantor is seized of a mining claim covering that certain tract of land situated in Sections 29 and 32, T. 22 S., R. 33 E., M.D.M., in the County of Tulare, State of California and within the exterior boundaries of the Sequoia National Forest which said mining claim is known as the Garnet Tungsten Mine, and

Whereas the said grantor has agreed, in consideration of the sum of one dollar (\$1.00) to be paid to him by the said grantee, to grant an easement or right of way for a road over and across the said tract of land embraced in his said mining claim.

NOW, THEREFORE, THIS INDENTURE WITNESSETH:

That in pursuance of the said agreement and in consideration of the sum of one dollar (\$1.00) to him in hand paid by the said grantee, receipt whereof is hereby acknowledged, the grantor does hereby grant, bargain, sell, convey and confirm unto the said grantee an easement for a right of way for a road and with the full and complete right in the grantee for itself or its officers, employees, contractors or permittees for each and every purpose for which a road may be used under the laws of the State of California to pass and repass thereover, the said right of way and easement covered hereby being a strip of land 66 feet wide, or more if necessary to accommodate cuts or fills, traversing the above described premises according to the following general course and direction, to-wit: Southeasterly through the Garnet Tungsten Mine located in Sections 29 and 32, T. 22 S., R. 33 E., M.D.M.

TO HAVE AND TO HOLD the said easement and right of way by the said grantee as appurtenant to the lands of the said grantee within said national forest.

And the said grantor further covenants and agrees for himself and his heirs, executors, administrators, successors and assigns and for all and every person or persons whomsoever lawfully or equitable deriving any estate, right, title or interest of, in, or to the hereinbefore granted premises by, from, under or in trust or otherwise that they or each of them shall and will, prior to, or upon the issuance of a patent by the United States of America to the land on which this right of way is situated, or at any time or times thereafter, upon the request of an authorized agent of the grantee, make, do, and execute, or cause to be made, done and executed, all and such further or

other lawful acts, conveyances, instruments, and assurances in the law for the better and more effectual vesting and confirming the premises hereby granted in and to the grantee as the grantee or its agents may require; Provided, if at any time hereafter the said right of way and easement shall be abandoned by the United States of America or its assigns, the rights and privileges hereby granted shall cease and terminate and the land traversed thereby shall be freed from said easement as fully and completely as if this indenture had not been made.

IN WITNESS WHEREOF the grantor has executed this instrument at Kernville, County of Kern, State of California, on the day and year first above written.

(SEAL)

(SEAL)

San Francisco

E
PUBLICATIONS
Production
Road Right-of-Way
Handbook:

San Francisco, California

November 27, 1941

FOREST OFFICERS:

Attached are _____ sets of Forms R.5 and R.5-B which have been revised and supersede pages 23 and 24, and 27 and 28 of the Road Right-of-Way Handbook, 1941.

If additional copies of these Forms are required, we will be glad to furnish them upon request.

A. P. DEAN, Assistant Regional Forester

John H. Lawrence
By

Acting

*Posted
2/4/42
REL*

H A N D B O O K

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SPECIAL USE PERMITS
for
ROAD RIGHTS-OF-WAY
over
NATIONAL FOREST LAND
California
1941

-oOo-

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I PURPOSE

1. To disseminate information relative to special use permits for road rights-of-way over National Forest land.
2. To promote better understanding by forest officers and the public as to why, when, and how permits are issued.
3. To direct attention to, and assist in fulfillment of Forest Service responsibilities for management of lands in the forests affected by construction of roads.

II WHY PERMIT IS NECESSARY

1. To comply with Regulation L-7 by the Secretary of Agriculture as amended February 9, 1929. (See p. 31 appendix)
2. It is illegal for the State or political subdivisions to expend money for construction of roads over National Forest lands without Forest Service special-use permit or other form of right-of-way such as easements or special grants.
3. Conflict must be avoided between the road and other use, present and future, of National Forest lands.

4. To assure proper correlation in location and design of the road with the All-Purpose Transportation Plan.

5. To avoid destruction of fish life by silting of streams.

6. To avoid destruction of small meadows essential for recreation or other use.

7. To avoid conflict with power withdrawals. Road has no right on power withdrawal without permission of Federal Power Commission. (See p. 14, article 3.1)

8. To minimize disfiguration of the landscape by fitting the location and design of the road to the topography so far as consistent with the speed, free flow, and safety of the volume of traffic for which the road is designed.

9. To provide for proper maintenance of the road.

10. To provide against fire hazards.

11. To provide against flood damage.

12. To assure adequate erosion control.

13. To prevent unnecessary timber cutting.

14. To assure preservation of roadside natural scenery.

15. To prevent conflict with Forest Service administration plans.

16. To correlate activities of numerous road building agencies in the National Forests. Note: A recent check showed that 67 different road building organizations were operating in the National Forests of California.

17. To assure that the practice of road building agencies in regard to width of right-of-way, scenic and erosion control on private land adjacent to forest land, conforms to the Forest Service

policy for treatment of roadside strips in the forests. In consideration of free right-of-way over forest land, this is a fair and reasonable request of the permittee and is essential in order to accomplish the purpose of the Forest Service policy.

III WHEN PERMIT IS NECESSARY

1. Special-use permits must be obtained from the Forest Service by all persons or agencies before beginning clearing or construction for any road on National Forest land except Forest Highways for which construction has been approved by the Secretary of Agriculture. These are the Forest Highways included in the construction program recommended each year jointly by the Regional Forester, the Public Roads Administrator, and the State Highway Engineer. (See p. 31, Reg. L-7)

2. Permit is unnecessary for minor improvement such as reshaping or surfacing an existing road where right-of-way has been established, but a permit is necessary for major improvements such as change in location, widening that requires cutting of green timber or construction of retaining walls, change in size, location, and discharge of drainage structures, or overcasting materials that may result in erosion and damage to waterways and resources below.

IV HOW TO PREPARE PERMIT

1. The Forest Supervisor should inform anyone contemplating construction of a road on National Forest land that a special-use

permit is required, and request that an application be submitted on form R.5 (see p. 24).

2. When an application is received, the Forest Supervisor, or a well-qualified representative, should make a thorough field study of the proposed project, using as a guide, the Outline of Report on Application for Special-Use Road Right-of-Way, form R.5-A (see p. 25).

The study should include a survey of sections of the route over private lands within or adjacent to the National Forest, during which an effort should be made to assure that right-of-way and roadside treatment of these sections conform to Forest Service policy for adjoining forest land.

3. Detailed survey, plans, and specifications are necessary for most high type roads and for important minor roads, and should be made a part of the special-use permit. They should supplement the provisions of the special-use permit and should cover in detail all requirements which cannot be fully covered by stipulations in the permit.

If survey, plans, and specifications appear to be necessary, the applicant should be instructed to prepare and submit to the Forest Supervisor two complete sets of plans and specifications for review before right-of-way will be granted. (See example of plans and specifications, p. 41 appendix).

4. When the Supervisor has become fully informed regarding location, design, and other essentials of the proposed road construction, the permit will be drafted in the form of the Typical Permit, pages 7 and 8.

V ACTION TO BE TAKEN WHEN PERMIT IS PREPARED

1. When a special-use permit has been prepared for approval by the Regional Forester, the following action will be taken:

The Supervisor will send to the Regional Forester -

- a. Original and 4 copies of the permit. (See p.4, item 4)
- b. One copy of the Application for Permit. (See p.3, sec.IV, item 1)
- c. One copy of the Reconnaissance Report. (See p.4, item 2)
- d. One set Plans and Specifications - if a necessary part of the permit. (See p.4, item 3)

The Regional Forester, after approving the permit, will return to the Supervisor - 3 signed and 1 unsigned copies.

The Permittee will sign the 3 copies of permit and return 2 to the Supervisor.

The Supervisor will return 1 fully signed copy of the permit to the Regional Forester.

2. Whenever a permit is issued by the Supervisor, for a minor private road, there will be sent to the Regional Forester:

- a. Two copies of Application for Permit (p.24, form R.5).
- b. Two copies of Report on Application for Permit (p. 25, form R.5-A).
- c. Two copies of the Special-Use Permit for Right-of-way (Typical Permit p. 7).

VI ACTION TO BE TAKEN AFTER PERMIT IS ISSUED

1. While the road clearing or construction is in progress, the Supervisor or a qualified member of his staff should make

regular inspections to assure that the permittee is complying with the provisions of the permit.

2. In case of non-conformance with the provisions of the permit, the Supervisor will take appropriate action to see that the provisions are enforced.

3. Monthly inspection reports; or more often if necessary, should be made in accordance with form R.5-B, p. 27 and one copy sent to the Regional Forester.

4. Following completion of construction, inspections will be made as necessary to see that the project is satisfactorily maintained.

5. Practically all R-5 special-use permits issued for roads and highways contain stipulations relative to maintaining the project, fire prevention precautions, and frequently erosion control requirements, all of which are applicable after actual construction has been finished. Therefore, in order to facilitate enforcement of such requirements, it has been the general practice not to close road permit cases when the construction work is completed. Of course in cases where use of a permitted road is definitely abandoned, or the permittee through disposal of holdings ceases to be responsible for fulfillment of the requirements, then the permit should be terminated and the case closed.

VII TYPICAL PERMIT WITH ALTERNATE AND SUPPLEMENTARY PROVISIONS

L

USES - Name of Forest San Francisco, California
Name of Applicant - Date of Application
Name of Road/or Highway _____, 19 ____

SPECIAL-USE PERMIT

FOR

ROAD RIGHT-OF-WAY

In accordance with the provisions of Regulation L-7, as approved by the Secretary of Agriculture on February 9, 1929, and subject to the following additional stipulations,
(name of permittee)
of _____, State of _____, is hereby granted
(address)
a special-use permit for a right-of-way not exceeding *
(132 or 66)
feet in width over National Forest land in the
(name of Forest)
National Forest, for the purpose of _____ and
(constructing or improving)
maintaining a _____ road located more specifically and
(public or private)
described as follows: T. _____
(describe by legal subdivisions)
R. _____ B.M., approximately _____ in length
(feet/miles)
from _____ to _____ as shown on the attached
(describe terminus) (describe terminus)
map entitled _____ dated _____, 19 ____.

*Rights-of-way shall be 132 feet in width for primary county roads and Federal or State highways. Rights-of-way shall be 66 feet for all other roads.

Said road to be constructed and maintained in accordance with the following General Stipulations, Standard Specifications, and Special Provisions which are hereby made a part of this permit:

1. GENERAL STIPULATIONS (To be inserted in all permits)
(Provisions numbered 1.1, 1.2, 1.3, etc.)
2. STANDARD SPECIFICATIONS (To be inserted in all permits)
(Provisions numbers 2.1, 2.2, 2.3, etc.)
3. SPECIAL PROVISIONS (To be inserted as necessary)
(Provisions numbered 3.1, 3.2, 3.3, etc.)

_____, 19____. Approved

S. B. SHOW,
Regional Forester,

By

Acting

In consideration of the privileges granted by this permit, the permittee does hereby stipulate and agree to conform to and abide by the regulations, specifications, and special provisions contained herein.

_____, 19____.

Title _____

1. GENERAL STIPULATIONS



1.1 (a) Duration of Permit

This permit is issued free of charge in accordance with the provisions of Reg. U-11, and may be terminated at any time for cause.

--Or--

1.1 (b) Annual Fee for Private Roads

This permit is issued in accordance with the provisions of Reg. U-12, and in consideration for the special use of forest land the permittee shall pay to the Regional Fiscal Agent designated by the Forest Officer, for deposit to the credit of the Treasurer of the United States, the sum of _____ dollars (\$_____) beginning _____ 19 _____, and annually thereafter on _____, during the life of this permit. Failure to make annual payment, or to comply with the terms and stipulations herein, shall be cause for terminating or revoking the permit.

1.2 Prior Claims

This permit is issued subject to all prior valid claims, including right granted by the Secretary of Agriculture under the Act of June 4, 1897 and/or of March 4, 1915.

1.3 Observance of Laws and Regulations

The permittee shall comply with Federal, State, and County laws, and rules and regulations of the Department of Agriculture governing the administration and protection of the National Forests, as are applicable to the premises.

The permittee shall require its employees, contractors, and employees of contractors, both independently and at the request of Forest officers, to do all reasonably within their power to prevent and suppress fires. During the period of fire danger, the smoking, campfire, and other fire prevention measures in effect on the National Forest at the time, shall be strictly observed.

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1.4 Access to Forest Officers

During the period of construction on this project, and thereafter during the life of this permit, Forest officers shall at all times have unrestricted access in, through, and across all the lands within the right-of-way, in the performance of their official duties.

1.5 Liability for Damage by Permittee

The permittee shall fully and promptly replace all Government property destroyed, and fully and promptly repair all damage other than ordinary wear and tear to roads, trails, telephone lines, or any Government improvements within the National Forest, resulting from the permittee's use of the right-of-way.

The permittee agrees to pay to the Forest Service, on demand, any and all expenses incurred by the United States in suppressing fire caused by the permittee or its agent that is responsible for the construction of this road. All fires occurring in the vicinity of the work of the permittee or its construction agents, shall be presumed to have been caused by the permittee, unless permittee shall show affirmatively that the fire was caused by others than itself or agency responsible for the construction.

2. STANDARD SPECIFICATIONS

2.1 (a) Plans, Profiles, and Specifications

The highway shall be constructed strictly in accordance with plans, profiles, and specifications entitled _____, dated _____, 19 _____, and as staked on the ground.

Advance written approval by the Regional Forester must be obtained before any changes may be made from this location.

--Or--

2.1 (b) Construction Standards and Location

The road shall be constructed to the following standards and upon the location as staked, flagged or marked upon the ground and approved by the Forest Supervisor. Advance written approval

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by the Forest Supervisor must be obtained before any changes may be made from this location.

Width The road shall be constructed in accordance with the dimensions and specifications as shown on the attached diagram entitled "Typical Grading Sections, Truck Trails, with Standard Width Tables," which is hereby made a part of this provision. (See page 45)

Alignment The minimum centerline radius of horizontal curves shall be _____ feet, and whenever it is economically feasible, curves of longer radii than the minimum shall be constructed.

Gradient Ruling gradient shall be not over _____%, with maximum of _____% for a distance not exceeding 1,000 feet. Not more than 1500 feet of any combination of grades in excess of _____% shall be used in any one mile. The grade on horizontal curves with radii of _____ or less, shall be compensated for curvature and shall not exceed _____%.

Vertical Curves Vertical curves at the intersection of all grade tangents, shall be constructed with sufficient length to insure good visibility and riding qualities, and shall not coincide with horizontal curves. The minimum sight distances on vertical curves shall be not less than 200 feet.

Vertical curves constructed at such locations as to permit vehicles to approach the curve at a speed in excess of 20 but less than 30 m.p.h., shall be constructed with a minimum sight distance of 300 feet, and on locations where speeds between 30 and 40 m.p.h. may occur, a sight distance of 500 feet or more is required.

Superelevation of Curves All horizontal curves with radii less than 1,000 feet shall be superelevated in accordance with standard engineering practice.

2.2 Bridges

All bridges shall be located, designed, and constructed in accordance with the best current engineering practice; shall conform to the standards adopted for the road, and shall be adequate in strength and in other respects to permit free flow of all traffic which may use the road. Plans and specifications for bridges, with span of 30 feet or more in length, shall be prepared by the permittee and submitted for approval by the Regional Forester before construction is undertaken.

2.3 Period of Construction

Construction shall begin within _____ months, and shall

be completed within _____ months, from date of issuance of this permit, unless an extension of time is granted by the Forest Supervisor.

2.4 Connections with State or County Highways

Prior to construction of the "take-off connections" from County or State highways, the permittee shall secure necessary permission from the proper County or State authorities.

2.5 Clearing

No timber shall be cut or destroyed on the right-of-way except such as is necessary to the actual road construction, and a reasonable right-of-way clearance on the width specified in this permit.

2.6 Blasting

To prevent future slides and to preserve the stability of cut slopes, every effort shall be made to reduce the use of explosives to a minimum. Blasting operations shall be conducted under the most careful supervision. The Forest Supervisor shall have the authority to require the permittee to discontinue any method of blasting which in his opinion is dangerous to the public or destructive to property or natural features.

2.7 Excavation

The road shall be brought to final grade as soon as possible after the rough grading work is completed. All operations must be kept in such a balance with each other that in no case will finishing (ripping, grading, etc.) be more than two miles behind the head end of pioneer work; or complete installation of drainage structures (culverts, surface drains, intercepting dips, special drainage ditches, etc.) be more than one mile behind finishing operations.

2.8 Cut and Fill Slopes

Permission is given to allow 'cut' and 'fill' slopes to extend beyond the limits of the right-of-way widths as granted by this permit, on those portions where the terrain is so precipitous as to require such action.

2.9 Borrow Pits

No borrow, sand or gravel pits, stone quarries, construction camps, or other improvements, will be established on the right-of-way or adjacent National Forest land, without advance approval and a special-use permit from the Forest Supervisor, and only at such locations as designated by the Supervisor.

2.10 Construction Roads

If the permittee requires temporary roads in the performance of the work, the location of such roads must be approved in advance by the Forest Supervisor; and as far as possible, the construction of such roads shall cause a minimum disturbance to natural conditions. When these temporary roads have served their purpose, the natural surface shall be restored as nearly as possible to the original condition.

2.11 Channel Changes

No change shall be made in the course of natural channels of streams intersecting or paralleling the road, without advance written approval from the Forest Supervisor.

2.12 Erosion Control

To the fullest practicable extent consistent with the service requirements of the highway or road, its design, location, and construction will be carried on in a manner that will cause the least disfiguration of the landscape and reduce erosive surface to a minimum. Materials shall be balanced, if possible, but if waste becomes necessary, such surplus will be deposited in such a manner that it will not create a displeasing appearance along the road and, most important, so that it will remain permanently in place and will not increase the normal debris load in any stream.

To reduce scarring and erosion to a minimum, 'slide material' that may occur after construction work is completed will be disposed of by 'end hauling' to the upper side of through fills, or to locations where it will not destroy or prevent revegetation of embankment slopes, disfigure the scenic values of the roadside, or be susceptible to erosion.

2.13 Drainage

Drainage structures adequate in number, location, and dimensions shall be installed to assure prevention of damage to

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road in the event of heavy storms and consequent silting of waterways below.

3. SPECIAL PROVISIONS

3.1 Federal Power Withdrawals

This permit is subject to all rights for electric transmission lines or other power purposes, now effective, or which may become effective as a result of any application now pending before the Federal Power Commission; and it is understood the permittee must fully protect such rights in a manner satisfactory to the holder and to the Federal Power Commission.

NOTE: This provision shall always be inserted if any portion of the highway or road right-of-way crosses lands occupied or reserved for electric transmission lines.

When the lands crossed by the right-of-way have been classified or withdrawn for power purposes under the Act of June 25, 1910, or the Federal Water Power Act of June 10, 1920, the following stipulation shall also be included in the permit.

The lands described in this permit are (in part, or all) covered by (Federal Power Site Classifications No. _____, and/or Federal Power Withdrawal Project No. _____) and, therefore, are subject to use at any time in connection with the development of water power. This permit, therefore, is issued with the specific understanding that it shall not interfere with such development and may, if necessary, be terminated upon twelve (12) months' notice that in the judgment of the Federal Power Commission the lands occupied are needed for use in connection with the generation of the hydroelectric power or any other purpose contemplated by the Acts under which the lands have been withdrawn. It is further understood that the permittee assumes all risks in case it is used for power purposes, and that the permittee can look for no compensation in that event.

3.2 Rights-of-way

In consideration of the free use of National Forest lands granted by this permit, the permittee hereby stipulates and agrees to procure and maintain rights-of-way not less than _____ feet in width over private lands which are crossed by the proposed road, located more specifically and described as

follows: _____ T. _____ R. _____,
B.M., as shown on map entitled: _____
dated _____, 19 _____, and which is hereby made a
part of this permit.

It is further stipulated and agreed that the said rights-of-way are essentially for road purposes only and shall be sufficient in width to fully protect roadside natural scenery. The permittee shall not use said rights-of-way in a manner which, in the opinion of the Forest Supervisor, will be destructive to roadside scenic values.

3.3 Roadway Clearing

Roadway clearing shall consist of the removal of timber, brush, and debris from within the area between the outer limits of excavation or embankment slopes.

Roadway clearing and disposal of the brush and slash resulting therefrom, shall be, as far as burning conditions will allow, completed in advance of the excavating and other road construction work.

Brush shall be piled in small, compact piles, within the 'cleared strip' of the right-of-way prior to burning, and in such locations that when burned no damage will result to standing trees and other cover.

Trees within the limits of clearing, which have been marked, staked or otherwise designated by a Forest Officer as "Not to be cut," shall be carefully preserved and protected from damage during construction operations.

Trees of _____ inches or larger at the base, which have been cleared from the roadway shall be cut into lengths of _____ feet and neatly piled at locations to be selected or approved by the Forest Supervisor, or his designated representative not more than _____ feet in distance from the stump of the tree.

The permittee shall pay the U. S. Forest Service for any and all merchantable timber cut or destroyed. Payment shall be made at the rate of \$ _____ per M for Ponderosa Pine and \$ _____ per M for Incense Cedar,* and at such time and in such manner as requested by the Forest Supervisor of the _____ National Forest.

All snags which will reach within 50' of the road in falling, or be likely to slide onto the road, shall be felled and disposed of in the same manner as provided for trees within the cleared strip.

* Insert additional rates for other types of timber as required.

The permittee shall clear all inflammable material from a strip of land on each side of the roadway to a width of not less than _____ feet or more than _____ feet; but the clearing shall not involve the removal of brush and ground cover to such an extent as to impair the aesthetic value of the roadside.

3.4 Blasting

When the use of explosives is necessary for the prosecution of the work, the permittee shall use the utmost care not to endanger life or property.

Blasting operations shall be conducted under the most careful supervision, and only with specific permission from the Forest Supervisor. The permittee shall adopt precautions in using explosives which will prevent damage to surrounding objects and the scattering of rocks, stumps, or other debris outside of the roadway slopes. Where necessary, and at any point of special danger, the permittee shall use suitable mats or some other approved method to smother the blasts, or ripping may be required instead of blasting.

All explosives shall be stored in a secure manner, in compliance with local laws and ordinances, and all such storage places shall be marked clearly "DANGEROUS - EXPLOSIVES." Where no local laws or ordinances apply, storage shall be provided satisfactory to the Forest Supervisor, and in general not closer than 1,000 feet from the road, or from any building or camping area.

The permittee shall use only electric detonators for blasting during the period from May 1 to October 31, and during other periods as required by the Forest Supervisor.

When necessary, in the opinion of the Forest Supervisor, the permittee shall employ a watchman whose duty it shall be to patrol after blasts are discharged, for a sufficient period of time to insure against the escape of fire from such operations.

A close watch shall be kept after each blast to see that no fire starts. The following equipment shall be kept at the scene of all blasting operations: _____ five-gallon back pack pumps kept filled with water _____ shovels and _____ axes.

3.5 Excavation

Cut slopes shall be not steeper than 3/4:1 in soil, 1/2:1 in shale or decomposed rock, and 1/4:1 in solid rock.

The tops of all cuts, except in solid rock shall be rounded off to harmonize more naturally with the slope of the adjacent natural terrain; and similarly, the slope of cut banks shall be flattened to make a pleasing transition to natural or embankment slopes.

The permittee may be required by the Forest Supervisor to finish any section on which work is in progress before work is started on any additional section.

The roadbed shall be scarified to a depth of 8 inches below final grade, and all rock ribs, stumps, and roots removed therefrom.

Turnouts shall be constructed intervisible, and shall be located approximately one-tenth of a mile apart. Turnouts shall be at least 100 feet in length overall and have a usable width of 20 feet for a distance of 50 feet.

3.6 Embankment

All suitable materials removed from the excavation shall be used as far as practicable in the formation of the embankment. No excavated material shall be wasted except at such locations as may be authorized by the Forest Supervisor.

Embankments containing less than 50% of rock shall be constructed with slopes of $1\frac{1}{2}$:1. The slope of embankments containing more than 50% of rock shall be $1\frac{1}{4}$:1.

To allow for settlement, the height of uncompacted or end-dumped fills shall be increased 10% above final centerline grade.

On both sides of through fills on tangent alignment and on the inside of fills on curves, raised shoulders (roadway dykes) _____ inches in height shall be installed to prevent erosion of fill slopes. At such locations the width of the embankment shall be increased to permit the installation of raised shoulders without decreasing the travelable width of the road.

To protect fish life and scenic values, no excavated material shall be deposited within the channels of any live stream. Toe walls of approved design shall be constructed at the lower edge of all embankments wherever there is a possibility of erosion of fill material by the stream.

Embankments shall be formed of suitable material, placed in successive layers 12 inches in thickness, for the full width of the cross section of the road. Each layer shall be thoroughly compacted before placing the next layer. When rock is being used in the embankment, it should be carefully distributed, and

the interstices filled with finer material to form a dense, compact mass. No rocks or hard lumps, which cannot readily be broken up into pieces not over six inches in diameter, shall be placed in the upper 12-inch layer of embankments.

Construction of portions of embankments by the end-dumping method will be permitted on thin sidehill embankments, where the horizontal distance from original ground to embankment slope line is less than 8 feet, provided however, that where practicable, the uncompacted portions of the embankment shall be constructed of available rocky material. The upper 10 feet of all embankments shall be placed and compacted in layers as specified above. However, all such end-dumped embankments must be graded to a $1\frac{1}{2}:1$ slope.

3.7 Drainage

Drainage structures shall be installed in sufficient number and size to remove all normal flood waters from flowing over roadway surfaces or embankments.

Pipe culverts shall be installed with sufficient fall to prevent clogging; grades of culverts installed in natural water courses shall equal the fall of the channel.

Culverts shall be located to empty into natural stream-channels, or rock mats shall be provided to prevent erosion of new channels.

3.8 Miscellaneous Structures

Cattle guards equivalent to standard Forest Service design shall be installed by the permittee at the following locations:

Fences equivalent to standard Forest Service design shall be constructed and maintained by the permittee on the side of the right-of-way between _____ and _____ in Section _____, T. _____, R. _____.

Gates equivalent to standard Forest Service design shall be installed and maintained by the permittee at _____ and shall be so constructed that they may be locked with a standard Forest Service lock.

3.9 Erosion Control

Embankment slopes shall be protected from erosion in accordance with the specifications issued by Region 5, U. S. Forest Service, entitled "General Specifications of Erosion Control Methods," which are hereby made a part of this permit.

--Or--

Cut Banks: shall be protected from erosion by the following methods:

(a) They shall be so sloped that the soil will stay in place, and the intersection of the cut slope, with the ground line, shall be rounded, beginning $2\frac{1}{2}$ feet back of the cut stake and extending $2\frac{1}{2}$ feet down the cut slope.

(b) They will be planted to _____

by the following method _____

Fill Banks: shall be protected from erosion by the following methods:

(a) Construction of brush wattles _____

(b) Broadcast sowing of _____

(c) Planting of _____

by the following methods: _____

Topsoil: and mulch shall be removed to a depth of not less than _____ inches from the roadway, between station _____ and _____, and shall be transported and deposited in storage piles at locations designated by the Forest Engineer.

When erosion control structures have been installed, the topsoil shall be spread to a depth of six (6) inches on embankments to be designated by the Forest Engineer.

3.10 Roadside Scenic Values

Portions of the existing road which have been rendered unusable for road purposes by the proposed construction, shall be obliterated in such a manner as to reduce erosion and induce revegetation upon the former road surface.

No ropes, cables, or guys are to be fastened to or attached to any existing trees for anchorages or in lieu of placing of dead men, unless specifically authorized by the Forest Supervisor. When permitted, the trunk shall first be adequately wrapped with a sufficient thickness of burlap or canvas, over which soft wood cleats shall be tied, before any wire, chain, cable, or rope is attached to the tree.

Any timber, trees, or landscape features accidentally scarred or damaged by the permittee shall be treated as ordered by the Forest Supervisor. He may require that they be removed, neatly trimmed up, or restored as nearly as possible to the original condition. All scars made on trees by construction operations, or the removal of limbs, shall be painted as soon as possible with brown paint.

All limbs of trees which overhang the roadbed, and which are less than fifteen (15) feet above the finished grade, shall be sawed off close to the bole in a neat and workmanlike manner, and the scar covered with a coat of brown paint.

3.11 Fire Prevention and Suppression

During the fire danger season, as designated by the Forest Supervisor, no smoking will be allowed, except at such places as the District Ranger may designate and post as safe for such use.

In the event of fire, the permittee or its contractors shall permit the Forest Service or other cooperating fire-fighting agencies, to draw upon any or all existing water lines and reservoirs for water to be used for filling fire trucks or pumping for actual fire-fighting purposes.

The permittee, or the contractors employed by the permittee, shall maintain a standard of fire prevention measures, in and around all storage buildings, shops, magazines, etc., erected in connection with the construction of this project, that meet with the approval of the District Ranger. Materials of a highly inflammable nature shall be stored and handled in a manner satisfactory to the District Ranger.

As a protection against escape of fire, the permittee shall equip all gasoline and Diesel shovels, tractors and other internal combustion engines used (except as modified in writing by the Forest Supervisor), with spark arresters kept in constant use and repair, and satisfactory to the Forest Supervisor; also, shall

equip each tractor and truck with one shovel, one axe, and a fire extinguisher of not less than $1\frac{1}{2}$ quarts capacity, and each gasoline or Diesel shovel with six shovels, three axes, and three pack pumps. All fire tools and equipment shall be kept in good condition and available for instant use.

During the periods of construction, there shall be installed and maintained on the job, at such locations and in such manner as satisfactory to the District Ranger, fire fighting equipment as follows:

- 20 - 3 qt. canteens
- 8 - Axes (single or double bit)
- 15 - Shovels (long handled)
- 5 - Back pumps (5 gal. capacity each)
- 3 - Lanterns (Coleman gasoline)
- 1 - Tool grinder
- 10 - Files (mill, 10")
- 2 - Knapsacks
- 1 - Gallon gasoline for lanterns

The permittee or the contractor employed by the permittee to construct this project, shall employ or designate some competent employee as 'fire warden' for the project during such periods of construction as may be required by the Forest Supervisor. This man shall represent the permittee or the contractor in all matters pertaining to fire prevention and fire suppression on the job; his primary activity will be to enforce all the fire restriction measures outlined in this permit, and supervise all burning activities under the general direction of the District Ranger.

During the fire season only, and when ordered by the Forest Supervisor, the permittee shall employ a fire warden acceptable to the Forest Service; said fire warden to be paid by the permittee at a salary of not less than _____ per month. The fire warden shall not be considered as a part of the construction overhead of the road job, but shall devote his entire time to such duties as the Forest Supervisor and District Ranger shall deem necessary. He shall have complete charge of the fire prevention activities in camp and on the job, shall inspect gasoline and oil storage, fuel oil storage, powder and blasting camp storage; and the handling of fuels and blasting materials from storage to their place of use shall be subject to his inspection and recommendations. He shall supervise all brush and debris burning, shall establish and post smoking areas, and shall see that Forest Service regulations and interests are observed at all times. In case of a fire occurring on or immediately adjacent to the job, the fire warden shall assume full charge of the suppression of the fire, and shall remain in full charge until the arrival of the District Ranger to take charge of the fire.

3.12 Final Clean-up

Before final completion of construction, the right-of-way shall be cleared of all down timber, dead brush, logs and timbers. The material so removed shall be moved into the cleared right-of-way and disposed of in accordance with the provisions listed under "Roadway Clearing" item 3.3.

Immediately following completion of construction, the permittee shall clean the roadway, borrow pits; and all ground occupied by him in connection with the work, of all rubbish, excess materials, false work, temporary structures, and equipment; and all parts of the work shall be left in a neat and presentable condition.

Upon the abandonment, termination, or revocation of this permit, and in the absence of an agreement to the contrary, the permittee, if all the rental charges due the Government have been paid may, within a reasonable time to be determined by the Regional Forester, remove all structures which have been placed on the premises by the permittee, except where the material was furnished by the Forest Service; but upon failure to remove the structures within that period, they shall become the property of the United States.

3.13 Public Use

The permittee shall at all times conduct the work in such manner as will insure the least possible interference with traffic, and shall maintain crossings.

After construction operations have been completed, the road shall be open at all times to the free use of the public.

--Or--

The road shall be closed to public use.

--Or--

The road shall be open to public use at the discretion of the Forest Service.

3.14 Maintenance

Upon completion of the project, the permittee shall maintain the highway or road to the standards as constructed under the terms of this permit and in a manner satisfactory to the Forest Supervisor.

---Or---

This road shall be maintained annually by the permittee, in a passable condition during the period of the year it is needed for fire protection activities, unless agreement is reached between the Forest Supervisor, or his designated representative, and the permittee for other means of maintenance.

4. SUPPLEMENTAL PROVISIONS

NOTE: Supplemental provisions considered necessary by the Supervisor to cover local conditions shall be inserted in the permit and identified by index numbers 4.1; 4.2; 4.3; etc.

U
USES _____

Form R. 5

UNITED STATES DEPARTMENT OF AGRICULTURE

National Forest

APPLICATION FOR

SPECIAL-USE ROAD RIGHT-OF-WAY PERMIT

Application is hereby made for permission to use the following described lands in the _____ National Forest, consisting of a strip of land* _____ feet in width and _____ miles in length from _____ to _____ for the purpose of _____ and maintaining a _____ (constructing or improving) _____ (public or private) road to be used as a _____ (nature of use) _____ road located more specifically and described by legal subdivisions as follows: _____

Said road to be constructed to the following standards:
Width of roadway after settlement _____ feet; maximum gradient _____ percent; minimum radius of curvature _____ feet. It is expected that traffic over the road will approximate _____ passenger automobiles and _____ trucks per day.

Construction will begin within _____ days and be completed within _____ days after issuance of permit.

Date of Application

Signature of Applicant

Post Office Address

*Rights-of-way shall be 132 feet in width for primary county roads and Federal or State highways. Rights-of-way shall be 66 feet for all other roads.

(Place)

(Date)

(File Designation)

OUTLINE OF REPORT ON APPLICATION FOR SPECIAL-USE

ROAD RIGHT-OF-WAY

National Forest

GENERAL

Describe: Location of project - Use of adjacent land - Type of cover - Topographical and geological conditions - Relation to existing transportation system and other improvements - Type and volume of existing and future traffic.

LOCATION

1. Does the location and standard of the proposed road conform with the route planned for the All-Purpose Transportation System of the Forest? If not, explain why.

2. Will the proposed road conflict with other established uses?

3. Is any portion of the proposed right-of-way withdrawn by the Federal Power Commission for transmission lines or power development?

4. What restrictions are necessary to obtain minimum landscape disfiguration from the construction of the road?

5. Will the construction or use of the road be of value for fire suppression or will it increase the fire hazard?

6. Is the proposed road construction liable to cause erosion or flood damage to underlying areas?

7. Will construction of the road on the proposed location cause damage to fishing streams, meadow lands, timber, scenic values, or other forest resources, and can this be avoided by minor changes in location without materially decreasing the standards of the road or increasing the cost of construction and maintenance?

ALTERNATE ROUTES

Describe: Alternate routes and compare - physical features - geological formation in respect to erosion - length - standards - cost - service to traffic and forest resources.

RIGHTS-OF-WAY

Describe: Location, length, and width of rights-of-way across private lands necessary for the protection of roadside scenic values.

SPECIAL-USE PERMIT

1. Are complete detailed surveys, plans and specifications necessary?
2. Describe the standards of construction required to provide for free flow of traffic and service to forest resources.

SUMMARY

1. Definite recommendation for or against issuance of permit.
2. Enumerate alternate specifications and special provisions which should be included in the permit.
3. Outline supplemental provisions to meet local conditions.

APPENDIX

1. Map showing relation of proposed and alternate routes to existing roads, population centers and legal sub-divisions.
2. Typical Grading Sections for Truck Trails. (See p. 45)
3. Photographs: Typical views of proposed route, and existing roads. Identify photographs by descriptive titles.

Approved _____ 19 _____

(Signed)

Forest Supervisor

(Title)

U
USES _____

Form R. 5-B

UNITED STATES DEPARTMENT OF AGRICULTURE

National Forest

INSPECTION REPORT - ROAD SPECIAL-USE PERMIT

On _____ 19____, construction operations for the period
_____ to _____ 19____, on the _____ Road
by _____ were inspected for
compliance with the provisions of the special-use permit, as follows:

NO.	PROVISIONS OF PERMIT	Satisfactory
2.1	Compliance with approved Plans or Standards:	
2.2	Bridges	
2.3	Period of Construction	
2.4	Connection with other Roads	
2.5	Clearing - Completed From To	
2.6	Blasting - Completed From To	
2.7	Excavation- Completed From To	
2.8	Cut and Fill Slopes	
2.9	Borrow Pits	
2.10	Construction Roads	
2.11	Channel Changes	
2.12	Erosion Control	
2.13	Drainage	
3.	Special Provisions	
4.	Supplemental Provisions	

ROAD SPECIAL-USE PERMIT

: APPROVED _____ 19 _____ : SIGNED _____
 : _____ : _____
 : _____ : TITLE _____
 : FOREST SUPERVISOR _____

NOTE: Supervisor will take action as necessary to correct unsatisfactory conditions.

A P P E N D I X

VIII APPENDIX

1. REGULATIONS OF THE SECRETARY OF AGRICULTURE

Special Uses, General

Reg. L-1. All uses of National Forest lands and resources, except those provided for in regulations governing the disposal of timber and grazing of livestock, will be designated "special uses." Permits for the excavation of antiquities under the act of June 8, 1906 (34 Stat.225), and for the lease of lands under the act of February 28, 1899 (30 Stat.908), may be granted only by the Secretary of Agriculture. All other permits for special uses may be granted by the Chief of the Forest Service, or by the Regional Forester, Supervisor, or Ranger as instructed by the Chief of the Forest Service, and subject to such conditions as to area, time, charges, and other requirements as may be provided by these regulations and the instructions issued thereunder.

All special-use permittees must comply with all State and Federal laws and all regulations of the Department of Agriculture relating to the National Forests, and conduct themselves in an orderly manner.

A special-use permit may be terminated, with the consent of the permittee, or because of non-payment of fees due, by the officer by whom it was issued or by his successor, but may be revoked only by the Secretary of Agriculture or by an officer of the Forest Service superior in rank to the one by whom the permit was issued. Appeals from action relating to special-use permits may be taken as provided in Regulation A-10.

Reg. L-2. Special-use permits for the following purposes will be issued without charge:

(J) Roads and trails which are free public highways, and airports and air navigation facilities which are open to the free use of the public.

(K) Stone, earth, and gravel used for projects constructed under permits; or for the construction or maintenance of public roads and trails; or by bona fide settlers, miners, and prospectors for building purposes by such persons.

Reg. L-3. Special-use permits, except as provided in Regulation L-2, or otherwise authorized by the Secretary of Agriculture, shall be conditioned upon the payment of an annual charge. The rates of charge and maximum limitations of area shall be prescribed by the Chief of the Forest Service, except for the use

of lands under the act of February 28, 1899, for hotels and dwellings adjacent to mineral and medicinal springs which shall be determined by the Secretary of Agriculture.

In case of sale of improvements and re-issuance or transfer of permit to the purchaser, any payments made upon the original permit may apply on the new permit, in the discretion of the forest officer issuing the permit.

Reg. L-7. The right-of-way over National Forest land for any state or county highway or road which is a part of the approved system of public roads shall be 132 feet in width for roads of class 1 or class 2, and 66 feet in width for roads of class 3 or other county roads of a secondary character; the centerline of the highway or road to be the centerline of the right-of-way except where otherwise provided by permit. National Forest lands within the limits of such right-of-way shall continue to be administered by the Forest Service, but their use for highway or road purposes shall be the dominant use, and no occupancy for other purposes shall hereafter be authorized by the Forest Supervisor or Regional Forester unless approved and concurred in by the appropriate state or county officials, but if agreement cannot be reached regarding other forms of use or occupancy regarded by the Regional Forester as essential to the proper use and management of the National Forest, the matter shall be submitted to the Secretary of Agriculture for final decision.

Approval by the Secretary of Agriculture of a Forest Highway Construction Program is ipso facto an authorization for the occupancy of National Forest lands by the highways included in such construction program, but where a permit for a project included within a Forest Highway program is desired by a state or county as a means of meeting legal or fiscal requirements, or as a basis for the execution of road contracts, such permit shall be issued by the Regional Forester and shall contain such conditions or be supported by such stipulations as may be necessary adequately to protect National Forest interests.

For highway or road projects which are not parts of an approved Forest Highway program, permits from the Regional Forester will be required. Before construction is initiated, a plat showing the definite location of the proposed highway or road shall be filed with the Forest Supervisor, who will determine the effect of the project upon National Forest interests and the changes in location or other features necessary adequately to safeguard such interest, and will transmit the plat and his report thereon to the Regional Forester. If changes recommended by the Supervisor are approved by the Regional Forester, but cannot be adjusted satisfactorily with the proponents of the road, an appeal may be taken under the provisions of Reg. A-10. If the proposed location and other features of the project are approved by the Regional Forester,

a permit shall be issued, without charge, containing such conditions or supported by such stipulations as may be necessary for the protection of the National Forest lands.

Trails may be constructed without formal permit if done with the consent and under the supervision of a forest officer, except that in the National Forests in Alaska such consent and supervision will not be required. No toll shall be charged for the use of roads or trails over National Forest lands, and the same shall be open to free public use unless otherwise specifically authorized by the Secretary of Agriculture, but a road built under permit at private expense to promote the construction of an important project may be temporarily closed to public use by order of the Regional Forester if its unrestricted use is dangerous to public safety or unduly interferes with the primary purposes for which it was built.

Roads traversing National Forest lands, which are not parts of state or county highway systems, and which are constructed and maintained wholly at the expense of the Federal Government and its private cooperators, may be designated by the Regional Forester as special service roads, and upon roads so designated by the operation of automobiles or trucks is prohibited except as authorized by the Regional Forester.

2. GENERAL SPECIFICATIONS FOR EROSION CONTROL

Erosion or the washing away of earth and rock, resulting from the disturbing of natural soil conditions by the construction of roads and highways, has caused irreparable damage in the past. Fortunately, this damage can be reduced and even eliminated by the observance of certain fundamental principles in the location, design, and construction of future roads and the adoption of various methods of erosion control.

Erosion damage may result from:

- (a) Water flowing across the roadway from higher elevations.
- (b) Water falling upon the roadbed.
- (c) Water falling upon excavation and embankment slopes or wasted material from roadway construction.

Perhaps the greatest damage is caused by failure of culverts or bridges to transport the water which has fallen on the terrain above, across the road. Embankments may be completely eroded by water flowing over the roadway, or embankments may fail by saturation caused by the impounding of water above them.

This condition is usually caused by inadequate drainage structures - incorrectly located, or which fail to function after being sealed by silt or debris.

Water falling directly upon the roadbed and allowed to accumulate may cause similar damage by overflowing embankments. The destructive force of this water rapidly increases as the volume and velocity increases; therefore, every effort must be made to remove surface water as soon as possible after it falls upon the road surface.

Incorrectly installed drainage structures which discharge upon unstable soils, or which divert streams from their natural channels, may cause erosion damage far beyond the confines of the roadway.

Finally, damage may be caused by rain falling directly upon embankment or cut slopes which have not been protected or stabilized. The following erosion control methods deal with the prevention of this type of erosion.

Excavation and embankment slopes are usually constructed so that the slopes have a sufficient angle of rest to produce stability under normal conditions, but when saturation occurs, the cohesion of the particles is destroyed and failure results. Therefore, stabilization of roadway slopes can only be successful when adequate drainage facilities are installed, preventing saturation, and when the slopes are constructed to a sufficient angle of repose for the particular material contained within the excavation or embankment.

There is a wide variance in the erodibility and angle of repose of different soils. It seems impossible to prescribe erosion control methods which could be successfully applied under all conditions. Specifications based on established methods must be adapted to each individual project. In isolated locations, the cost of slope fixation may not be warranted by economic conditions; while near centers of populations, large expenditures for erosion control may be fully justified.

By exercising good judgment and previous experience in the selection of the type, location, and design of drainage structures, and the proper location of the road, many of the causes of road erosion can be prevented without increasing the cost of construction.

The Forest Engineer, in preparing his reconnaissance report to the Forest Supervisor, should make definite recommendations for the installation of drainage structures, and specify the type of slope fixation in accordance with the instructions contained in the general specifications.

The following methods for erosion control on Forest Highway

embankments have been compiled from field observations and effectiveness of various types of erosion control experiments carried on throughout the State. These experiments have indicated that erosion control can be economically carried out during roadway construction; that slope erosion can be materially reduced and the formation of deep gullies on the fill slopes entirely prevented by the adoption of the following erosion control methods:

Layer Fills - Layer fills constructed with side slopes of approximately 1.5:1 and built up by adding and compacting successive layers of from 8" to 24" thickness are less susceptible than "end-dumped" fills to the forces of erosion. The side slopes having been constructed at the final angle of rest, there is less tendency toward settlement or "slumping" when saturated. However, even on the roads where the fills have been layered there is an outer surface of from 12" to 18" which is relatively loose. Unless this loose material is held in place by some mechanical means, such as the brush row or staked wattle, it is quite probable that, due to over-saturation of the soil by heavy rains, the force of gravity will overcome the cohesion of the loose soil. This action may be prevented by the installation of stakes and brush wattles. After several years of wettings by annual rains, with the assistance of roots of growing vegetation, this loose 12" to 18" of soil becomes bound to the finer soil below, and the need for mechanical anchorage will be eliminated.

End-Dump Fills - This type of fill is constructed by "end-dumping" from trucks, "casting" from a shovel, or "pushing over" by a bulldozer. Of course, none of this material is compacted. Side slopes of fills constructed in this manner are usually steeper when constructed than the final angle of rest. Consequently, before attempting erosion control, it is essential to obtain a slope closer to the final angle of rest. The fill may be flattened by the use of a dragline or some similar means. It is practically impossible to carry out erosion control during construction on end-dumped fills, but erosion control measures should be taken immediately after the placing of the fill.

The foregoing paragraphs have described the two general types of fill slopes on the basis of method of construction. Other factors influencing the erosion control treatment are length of slope, rock content, and slope gradient.

Six distinct methods of slope control have been developed, as follows:

1. The brush method.
2. The wattling method.
3. Hay, grain, and cuttings method.
4. Duff method.
5. The hay and grain method.
6. The forest litter method.

1. - The Brush Method

This method consists of laying brush 6" to 8" thick in layers every 3'6" measured vertically, on contour rows in the fills as they are constructed. The ends of the brush sticking out on the fill should be 12" out from the fill on the upper side. The material used for the brush in the fills may be any stiff, woody, leafy brush that can be obtained in reasonably straight lengths of 3 feet to 6 feet. Wide spreading and extremely stiff brush such as old oak and manzanita are difficult to compress and should be avoided, or should be "lopped," i.e., cutting off the stiff branches on two sides until the brush lies flat.

Three contour "wattles," 2" to 3" thick, made of long-stemmed hay, partly covered, should be proportionately spaced between the brush rows. The intervening spaces between the brush rows should be sowed to some common winter grain, wheat, barley, or rye, or a mixture of these. Approximately 100 pounds per acre should be sufficient. This space should then be covered with long-stemmed hay, 1" to 2" thick, anchored with rock and an occasional shovelful of soil. A special effort should be made to anchor the hay directly below the brush row.

2. - The Wattle Method

This method consists of packing lengths of brush into continuous thick "cables" partially buried across a slope at regular contour intervals and supported on the lower side by stakes. After the wattles are placed, cereal grains should be sown in 5-inch contour strips approximately one inch deep across the slopes, parallel to and a few inches above the wattles; a second strip of grain should be sown immediately below each wattle at the rate of about one seed to each square inch of surface. The space between the wattles should then be covered with one or two inches of long-stemmed hay, anchored with rock and an occasional shovelful of soil. In order to eliminate exposed soil areas above or below the brush wattles, the hay should be placed in the trench cut to receive the wattle, and allowed to overlap; then the brush wattle can be placed on top of the hay. On layered fills over 25-foot in length, the contour interval for the wattles would be $2\frac{1}{2}'$ measured vertically. For end-dump fills 25' to 75' in length, the contour interval for the wattles would be $2\frac{1}{2}'$ measured vertically. For end-dump fills over 75 feet in length, the contour interval will be 2-foot measured vertically. For supporting the wattle, 30-inch to 36-inch inert stakes, 2 x 1, should be placed 22" apart, the inert stakes of sawed lumber or dead brush to be alternated with stout living cuttings $1\frac{1}{2}"$ in diameter and 24" to 36" in length when possible. For the end-dump fills, some of the stakes may be 48" in length. The use of two lengths of stakes reduces to a minimum the effect of anchoring a single plane surface. The placement of the two sizes of stakes should be in the following manner; one 48-inch stake,

three three 36-inch stakes, and then one 48-inch stake. If cuttings are used, the utmost care should be taken in driving the cuttings to avoid unnecessary splitting or stripping of them. All live cuttings should be set deeply so that they will not protrude more than 3 inches or 4 inches above ground.

The material used for the wattles may be any stiff, woody, leafy brush that can be obtained in reasonably straight lengths of 3' to 6'. Wide spreading and extremely stiff brush should be avoided. Hay or straw may be used as a filler in these wattles if the brush is not leafy enough. The wattles should be approximately 10" thick and 8" wide. Approximately five tons of hay per acre will be needed - 40 pounds to 60 pounds of common winter grain.

3. - Hay, Grain, and Cuttings Method

This method consists of broadcasting some species of common winter grain, such as wheat, barley, or rye. Approximately 100 pounds per acre should be sufficient, 2-inch to 3-inch long-stemmed hay wattles should be placed 2'6" apart (slope distance). Then the entire fill surface should be covered by strewing 1" to 2" of long-stemmed hay, anchoring it with rock and occasional shovelfuls of soil. Hay should be put on at the rate of six tons per acre. Where this method is used it probably will be wise to use cuttings as a precautionary method in stabilizing the fill. Some type of sprouting shrub, such as baccharis, willow, or elderberry, will be suitable. These cuttings should be placed on the lower three-quarters of the fill, spaced in rows 30" apart between the hay wattles. The cuttings in the row should be 48 inches apart, alternating with the cuttings in the adjacent rows. The cuttings should not be less than one inch in diameter and 24" in length, and not over 4" of the cutting should extend above the ground. Make sure not to injure the cutting when putting it in the ground.

4. - The Duff Method

This method consists of spreading 3" to 5" of duff, such as pine needles, leaves, etc., over the entire fill and working it in with the fill soil. Large rocks which are reasonably well embedded in the fill should be left to assist in stabilizing the duff. In some cases it may be necessary to dig trenches horizontally along the fill so that the duff may be held in place.

5. - The Hay and Grain Method

This method consists of broadcasting some species of common winter grain, such as wheat, barley, or rye. Approximately 100 pounds per acre should be sufficient. Then the entire

fill surface should be covered by strewing long-stemmed hay 2" to 3" deep, anchoring this with rock and an occasional shovelful of soil. In regions of hard wind and heavy rains, it probably will be necessary to wattle this hay in the ground so as to stabilize it. Hay should be put on at the rate of 6 tons per acre. The slopes should be fairly smooth before doing erosion control work, so that water will not run under the hay and down previously formed gullies.

6. - The Forest Litter Method

This method is not to be used where a great deal of erosion is expected, but to be used in northern forests to assist and speed revegetation. The method consists of spreading forest litter (pine needles, leaves, small twigs, etc.) over parts of the fill. The entire fill does not have to be covered. It will be better to apply the litter during the process of layering the fills.

In addition, a seventh feature, namely riprap or dry laid rock walls at the toe of the slope, may sometimes be required as an integral part of any treatment to reduce the slope gradient and to stabilize the surface. Also, on narrow V-shaped fills where it is impossible to layer the lower portion of the fill, it will often be possible to roughly face this section with rock. Constructing the road so that larger boulders and rocks are concentrated in the base or toe of the fill will do a lot toward preventing erosion.

Revegetation Bank vegetation is a most effective protection against damaging erosion. Vegetation on cut and fill slopes, that approaches unaltered nature in appearance, increases the attractiveness of the road and at the same time reduces or prevents losses due to water, frost, or wind action. In sections where natural reproduction of shrubs and grass occurs, no treatment is necessary other than to slope the banks to the angle that will insure stability. Rounding the tops of cut slopes may also promote vegetation.

Mulches Of all the types of mechanical devices now being employed to provide favorable opportunities for the establishment of vegetation on highway slopes, probably the simplest method that has yet been developed, is the use of mulches composed of local organic materials such as straw, hay, leaf mold, and pine needles.

Besides protecting the surface of the slope from the erosible force of rainfall, mulches produce ameliorating effects, both physical and chemical, upon the soil to assist revegetation.

Topsoil Dressing Rich loam and topsoil may be stock piled during the rough grading, and later replaced on the surface of embankments to encourage vegetation on sterile soils.

Before this is done the slope should be stabilized, because topsoil dressing does not in itself prevent erosion but should be considered as a supplement to proven stabilization methods.

Seeding Sowing of grains and grasses upon fill slopes, either broadcast or in furrows, has proven very successful in many locations. By binding the soil together with fast growing roots, these plants form a protective covering for the first year, while slower growing but more permanent native plants are establishing themselves upon the slopes.

Classification of Fill Slopes and Application of Methods

The following classification of fill slopes and suggested erosion control methods are not intended to be absolutely rigid, but rather that some judgment must be exercised in the field in determining the best treatment for each slope. Rock content, intensity of rain and type of soil may make it desirable to vary the type of method to be used. The various conditions are itemized, followed by the method to be used to prevent erosion.

A. Layered Fills

1. Short slopes

- (a) Slope distance from the shoulder to the toe of the fill is less than 25'.
- (b) Slope gradient 46% or less.
- (c) Rock content less than 60%.

Use hay and grain method. Duff method in recreational areas.

2. Short slopes

- (a) Slope distance from shoulder to toe of fill is from 5' to 25'.
- (b) Slope gradient 46% or more.
- (c) Rock content less than 60%.

Use hay, grain, and cuttings method. Duff method in recreational areas.

3. Long slopes

- (a) Slope distance from shoulder to toe of fill is 25' or more.
- (b) Slope gradient 46% or less.

- (c) Rock content less than 60%.

Use hay, grain, and cuttings method.

4. Long Slopes

- (a) Slope distance from shoulder to toe of fill is 25' or more.
(b) Slope gradient 45% or more.
(c) Rock content less than 60%.

Use brush method or wattle method where brush is not available. Wattles 2'6" apart vertically. Brush rows 3'6" apart vertically.

5. Long or short slopes

- (a) Rock content more than 60%.

Use hay and grain method.

6. Fill slopes in northern or snow country where erosion is not a problem, but it is desirable to assist re-vegetation.

Use forest litter method.

B. Overcast or End-Dump Fills

1. Short slopes

- (a) Slope distance from shoulder to toe of fill is less than 25'.
(b) Slope gradient 45% or less.
(c) Rock content less than 60%.

Use hay and grain method. Duff method in recreational areas.

2. Short slopes

- (a) Slope distance from shoulder to toe of fill is from 5' to 25'.
(b) Slope gradient 46% or more.
(c) Rock content less than 60%.

Use hay, grain, and cuttings method. Duff method in recreational areas.

3. Medium slopes

- (a) Slope distance from shoulder to toe of fill is from 25' to 75'.
(b) Slope gradient 46% or less.
(c) Rock content less than 60%.

Use hay, grain, and cuttings method.

4. Medium slopes

- (a) Slope distance from shoulder to toe of fill is from 25' to 75'.
- (b) Slope gradient 46% or more.
- (c) Rock content less than 60%.

Use wattle method. Wattles 2'6" apart vertically.

5. Long slopes

- (a) Slope distance from shoulder to toe of fill is 75' or more.
- (b) Slope gradient 46% or more.
- (c) Rock content less than 60%.

Use wattle method. Wattles 2' apart vertically.

6. Long or short slopes

- (a) Rock content 60% or more.

Use hay and grain method.

7. Fill slopes in northern or snow country where erosion is not a problem, but it is desirable to assist revegetation.

Use forest litter method.

3. TYPICAL PLANS, PROFILES, AND SPECIFICATIONS

Article 3, page 4, provides that plans and profiles for most major and important minor roads shall be prepared and submitted by the applicant prior to issuance of permits. These plans should contain the following data:

Title Sheet

1. Name and address of applicant.
2. Name, termini, and length of proposed road.
3. Name of National Forest, County, and State.
4. Index to sheets.
5. Index map showing:
 - (a) Location of proposed route with relation to legal subdivisions, forest and county boundaries, important topographical features, existing roads and centers of population.
 - (b) Scale, legend, and north point.
6. Signature and title of official approving plan and date of approval.

The required data may be compiled as shown on the following sample Title Sheet, page 42.

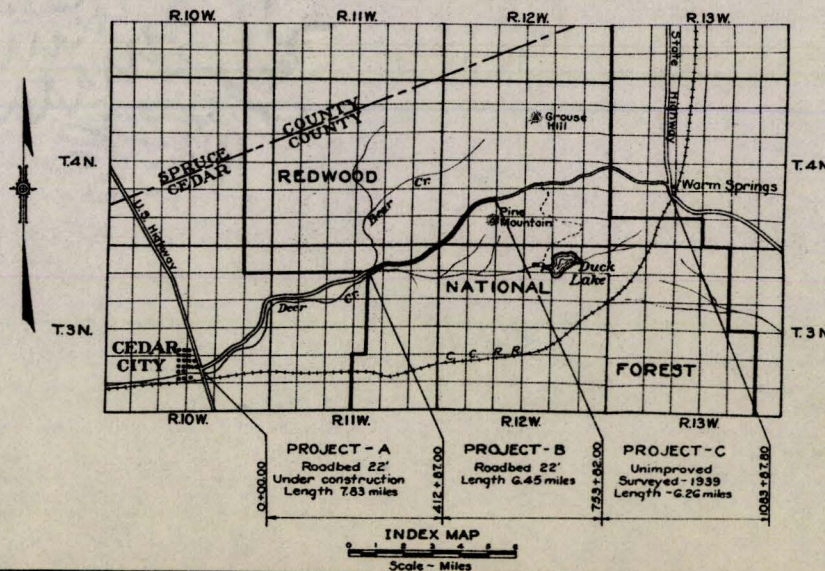
NOTE: The sample sheets (shown on pages 42, 44, and 48) are inserted in the Handbook merely for the purpose of illustrating one acceptable method of presenting the necessary data, but plans may be compiled in any standard form, which clearly delineates the proposed location and details of construction.

CEDAR COUNTY ROAD DEPARTMENT

PLANS FOR PROPOSED PINE MOUNTAIN HIGHWAY WEST FOREST BOUNDARY TO PINE MOUNTAIN 6.45 MILES REDWOOD NATIONAL FOREST CALIFORNIA

STATE	COUNTY	PROJECT	SHEET	DATE
CALIF.	CEDAR		1	19

INDEX TO SHEETS	
Sheet No.	Description
1	Title Sheet
2	Typical Cross Section
3 to 14	Plan & Profile Sta. 412+87 to Sta. 753+92
15	Miscellaneous Structures



APPROVED

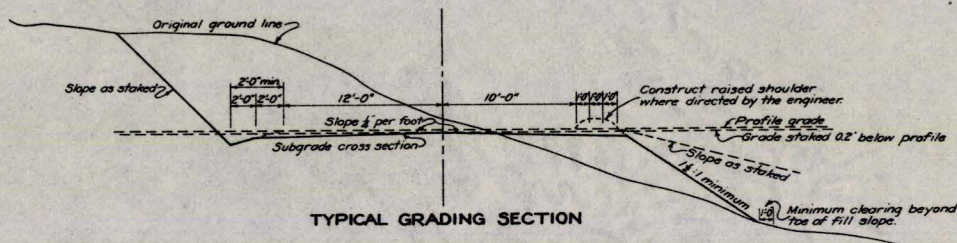
CHAIRMAN OF CEDAR COUNTY BOARD OF SUPERVISORS DATE _____
REGIONAL FORESTER-UNITED STATES FOREST SERVICE DATE _____

Typical Cross-Section Sheet

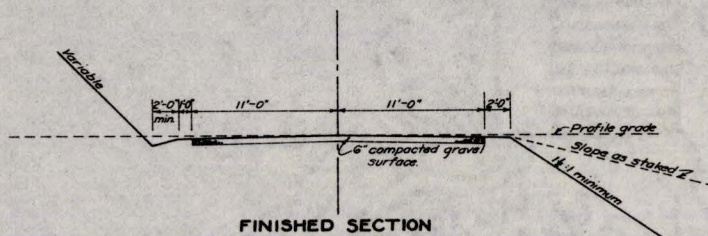
The following data should be included in the Typical Cross-Section Sheet. (See sample sheet page 44)

Typical roadway sections drawn to scale showing the following details:

- (1) Original Ground Lines.
- (2) Proposed roadbed for through-cut, cut and fill, and through-fill sections.
- (3) Dimensions to the nearest tenth of a foot indicating the widths of roadway, shoulders, ditches and roadway dykes.
- (4) The ratio of embankment and excavation slopes.
- (5) If the tops of cuts are to be rounded, show detail and dimensions.
- (6) Specifications for curve widening and super-elevation.
- (7) Scale and Sheet number.

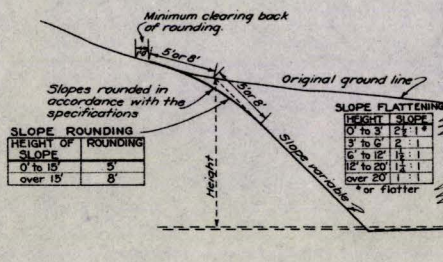
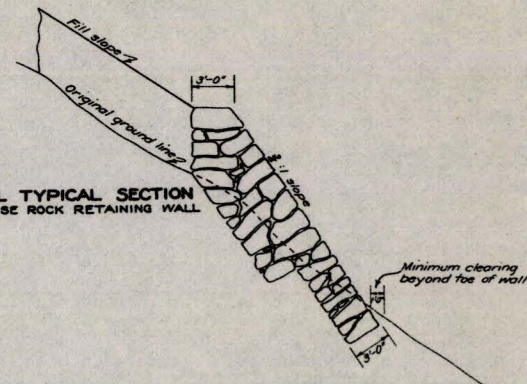


TYPICAL GRADING SECTION

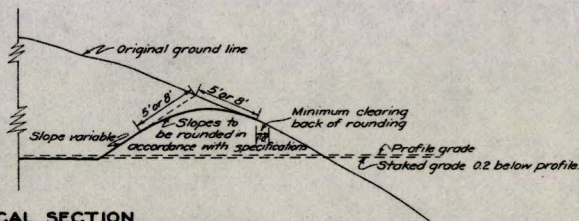


FINISHED SECTION

SPECIAL TYPICAL SECTION
SHOWING LOOSE ROCK RETAINING WALL



SPECIAL TYPICAL SECTION
SHOWING ROUNDING & FLATTENING OF UPPER & LOWER CUT SLOPES
IN MATERIAL OTHER THAN SOLID ROCK



CEDAR COUNTY
ROAD DEPARTMENT

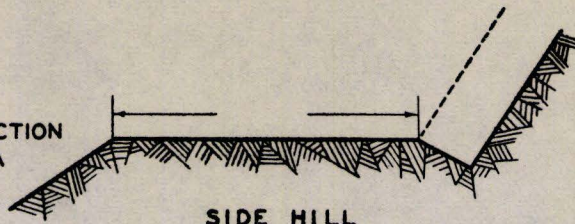
TYPICAL CROSS SECTIONS

PROJECT Pine Mountain Highway
NATIONAL FOREST Redwood
STATE California

DATE September 1939

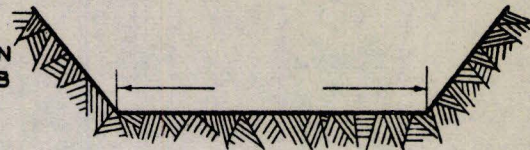
SCALE
0 1 2 3 feet

SECTION
A



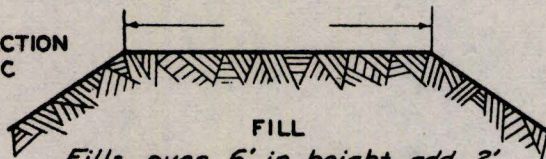
SIDE HILL

SECTION
B



THROUGH CUT

SECTION
C



FILL

*Fills over 6' in height add 2' to width in table.
Increase height of fills by 10% of ϵ height to allow for settlement.*

STANDARD WIDTHS AFTER SETTLEMENT

	A	B	C	D	E
SINGLE TRACK (Fire Control)	10	12	11	9	11
SINGLE TRACK (General Use)	11	12	12	10	12
DOUBLE TRACK	18	19	19	17	19
SINGLE TRACK, SURFACED	14	13	15	13	15
DOUBLE TRACK, SURFACED	21	20	22	20	22

SECTION
D



TURN PIKE

Make allowance for settlement as follows:

To be constructed from material excavated from side ditches unless additional height is needed for drainage

Section Feet

A	_____
C	_____
D	_____
E	_____

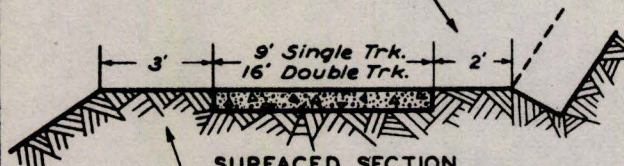
SECTION
E



FILL SECTION

2' Shoulder on all cut sections; cut side on side hill, both sides on through cut and turnpike.

Over wet ground with drainage ditches



SURFACED SECTION

3' shoulder on all fill sections, fill side on side hills, both sides on through fills.

Widths shown are net after settlement and exclusive of ditches. On unsurfaced truck trails, ditch to be built only and to the extent needed. Ditches to be constructed on all surfaced truck trails. Increase width on curves as instructed.

TYPICAL GRADING SECTIONS
TRUCK TRAILS
WITH
STANDARD WIDTH TABLE

1. Plans

Plans of the proposed centerline of construction shall be drawn to a scale not less than 1"-200'. Every 100-foot station should be indicated and at least every fifth station numbered. The station of the beginning and end of the project, the intersection with land lines and forest boundaries, and ties to section corners should be shown to the nearest foot. If the proposed centerline has not been staked, the preliminary survey line must be shown and the station of each angle point.

The following additional information is required:

1. The bearing and length of all centerline tangents.
2. The station of the beginning and end of all centerline curves, radius, central angle, length of arc, and semi-tangent distance.
3. Centerline equations ahead and back.
4. The location and dimension of all drainage structures, retaining walls and channel changes.
5. If private lands are crossed, show name of owner, width of right-of-way, and stations of the centerline intersections with the boundary lines.
6. Plot the location of all existing roads, trails, pole lines, and other improvements within 200 feet of the proposed centerline.
7. Show the location and elevation of all bench marks.
8. Show the location or indicate by bearing and distance all proposed borrow pits.
9. Show edge of fills which will extend beyond right-of-way.
10. If horizontal curves are spiraled, show type of spiral, beginning and end of spiral, and curve data.
11. Show the high water line of all rivers, streams, or lakes within 200' of the centerline, and all proposed channel changes.
12. Show scale and north point, and basis of bearings.

2. PROFILES

- (1) Show profile of original ground along the proposed centerline.
- (2) Show proposed centerline profile.
- (3) Show the percent of grade to the nearest hundredth of a foot between curve points.
- (4) Show the station and elevation of the intersection of grade tangents and length of vertical curves.
- (5) Show the station, type, length, and diameter of all culverts, and indicate their location by circles on the ground line.
- (6) Describe location of bench marks and indicate datum used.
- (7) Show the amount of excavation and embankment for each station and balance points.

BRIDGES AND DRAINAGE STRUCTURES

Show plan, elevation, and typical sections of all important structures drawn to scale, with dimensions and specifications.

MISCELLANEOUS STRUCTURES

Show plan, elevation, and typical sections drawn to scale, with dimensions and specifications.

NOTE: If the average cross slopes are steep or irregular, a topographical map extending beyond the limits of excavation and embankment, with contour intervals of 5' or 10' may be superimposed on the centerline plans; otherwise, one copy of the centerline cross sections must be included with the Plans and Profiles.

